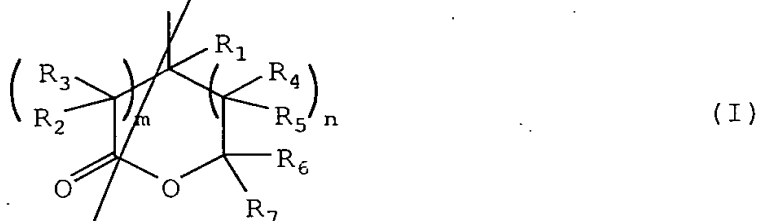


WHAT IS CLAIMED IS:

1. A positive photoresist composition comprising:

(A) a compound capable of generating an acid upon irradiation with actinic rays or radiation and

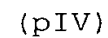
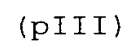
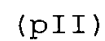
5 (B) a resin capable of decomposing under the action of an acid to increase the solubility in alkali, containing a repeating unit having a group represented by the following formula (I):

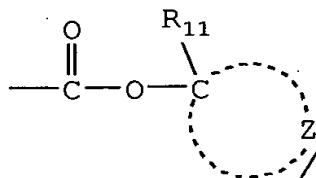


10 wherein  $R_1$  represents hydrogen atom or an alkyl group having from 1 to 4 carbon atoms, which may have a substituent,  $R_2$  to  $R_7$ , which may be the same or different, each represents hydrogen atom, an alkyl group which may have a substituent, a cycloalkyl group which may have a substituent or an  
15 alkenyl group which may have a substituent, provided that at least one of  $R_6$  and  $R_7$  is a group exclusive of hydrogen atom and  $R_6$  and  $R_7$  may combine to form a ring, and  $m$  and  $n$  each independently represents 0 or 1, provided that  $m$  and  $n$  are not 0 at the same time.

20 2. The positive photoresist composition as claimed in claim 1, wherein the resin (B) further contains a

bl<sup>5</sup>



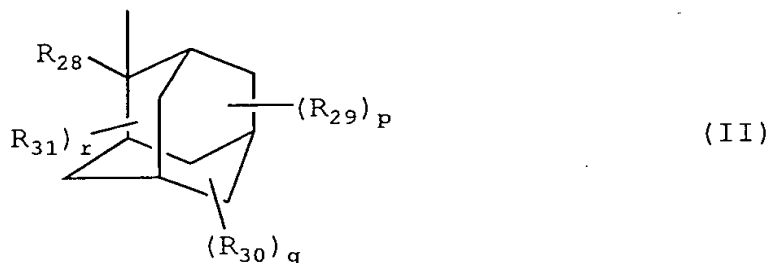


(pVI)

wherein R<sub>11</sub> represents a methyl group, an ethyl group, an n-propyl group, an isopropyl group, an n-butyl group, an isobutyl group or a sec-butyl group; Z represents an atomic group necessary for forming an alicyclic hydrocarbon group together with the carbon atom; R<sub>12</sub> to R<sub>16</sub> each independently represents a linear or branched alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms, provided that at least one of R<sub>12</sub> to R<sub>14</sub> or either one of R<sub>15</sub> and R<sub>16</sub> represents an alicyclic hydrocarbon group; R<sub>17</sub> to R<sub>21</sub> each independently represents hydrogen atom, a linear or branched alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms, provided that at least one of R<sub>17</sub> to R<sub>21</sub> represents an alicyclic hydrocarbon group and either one of R<sub>19</sub> and R<sub>21</sub> represents a linear or branched alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms; and R<sub>22</sub> to R<sub>25</sub> each independently represents a linear or branched alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms, provided that at least one of R<sub>22</sub> to R<sub>25</sub> represents an alicyclic

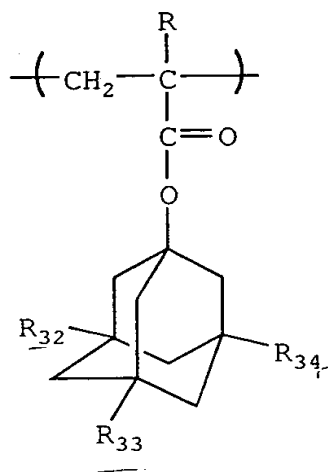
hydrocarbon group.

3. A positive photoresist composition as claimed in claim 2, wherein the alicyclic hydrocarbon structure-containing group represented by formula (pI), (pII), (pIII), (pIV), (pV) or (pVI) is a group represented by formula (II):



wherein  $R_{28}$  represents an alkyl group which may have a substituent,  $R_{29}$  to  $R_{31}$ , which may be the same or different, each represents a hydroxy group, a halogen atom, a carboxy group, an alkyl group which may have a substituent, a cycloalkyl group which may have a substituent, an alkenyl group which may have a substituent, an alkoxy group which may have a substituent, an alkoxycarbonyl group which may have a substituent or an acyl group which may have a substituent, and  $p$ ,  $q$  and  $r$  each independently represents 0 or an integer of 1 to 3.

4. The positive photoresist composition as claimed in claim 1, wherein the resin (B) contains a repeating unit represented by the following formula (a):



(a)

wherein R represents hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group having from 1 to 4 carbon atoms, and R<sub>32</sub> to R<sub>34</sub>, which may be the same or different, each represents hydrogen atom or a hydroxyl group, provided that at least one of R<sub>32</sub> to R<sub>34</sub> represents a hydroxyl group.

5. The positive photoresist composition as claimed in claim 1, which further contains an acid diffusion inhibitor.

6. The positive photoresist composition as claimed in claim 1, wherein the compound (A) is a sulfonium salt compound of sulfonium or iodonium.

7. The positive photoresist composition as in claim 1, wherein the compound (A) is a sulfonate compound of N-hydroxyimide or a disulfonyldiazomethane compound.

8. The positive photoresist composition as claimed

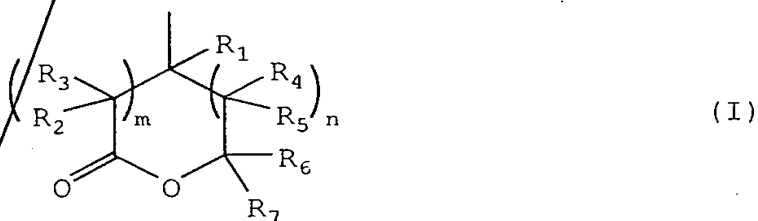
in claim 1, wherein the exposure light used is a far ultraviolet ray at a wavelength of 150 to 220 nm.

9. A positive photoresist composition for far ultraviolet exposure, comprising:

(A) a compound capable of generating an acid upon irradiation with actinic rays or radiation,

(B) a resin capable of decomposing under the action of an acid to increase the solubility in alkali, containing a repeating unit having a group represented by the following formula (I), and

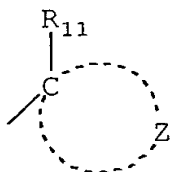
(C) a fluorine-containing and/or silicon-containing surfactant:



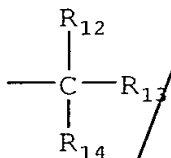
wherein R<sub>1</sub> represents hydrogen atom or an alkyl group having from 1 to 4 carbon atoms, which may have a substituent, R<sub>2</sub> to R<sub>7</sub>, which may be the same or different, each represents hydrogen atom, an alkyl group which may have a substituent, a cycloalkyl group which may have a substituent or an alkenyl group which may have a substituent, provided that at least one of R<sub>6</sub> and R<sub>7</sub> is a group exclusive of hydrogen atom and R<sub>5</sub> and R<sub>7</sub> may combine to form a ring, and m and n

each independently represents 0 or 1, provided that m and n are not 0 at the same time.

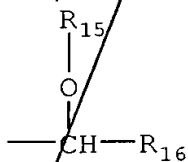
10. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the resin (B) further contains a repeating unit having an alkali-soluble group protected by at least one group containing an alicyclic hydrocarbon structure represented by the following formula (pI), (pII), (pIII), (pIV), (pV) or (pVI):



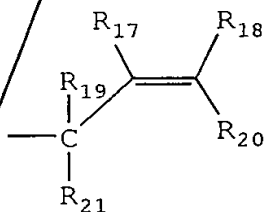
(pI)



(pII)

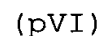


(pIII)



(pIV)

(pV)

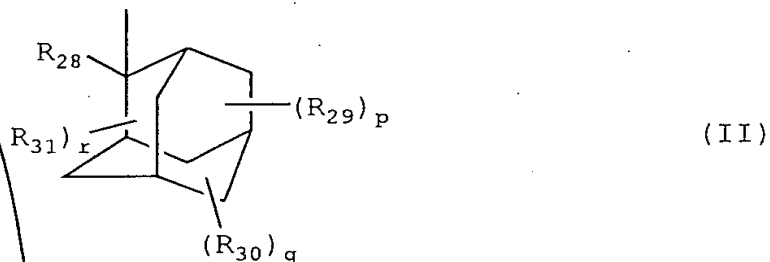


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alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms, provided that at least one of  $R_{22}$  to  $R_{25}$  represents an alicyclic hydrocarbon group.

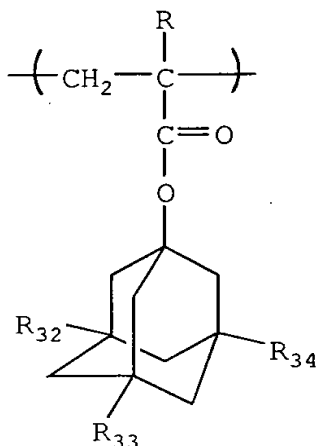
11. The positive photoresist composition for far ultraviolet exposure as claimed in claim 10, wherein the group containing an alicyclic hydrocarbon structure represented by the following formula (pI), (pII), (pIII), (pIV), (pV) or (pVI) is a group represented by the following formula (II):



wherein  $R_{26}$  represents an alkyl group which may have a substituent,  $R_{29}$  to  $R_{31}$ , which may be the same or different, each represents a hydroxy group, a halogen atom, a carboxy group, an alkyl group which may have a substituent, a cycloalkyl group which may have a substituent, an alkenyl group which may have a substituent, an alkoxy group which may have a substituent, an alkoxycarbonyl group which may have a substituent or an acyl group which may have a substituent, and  $p$ ,  $q$  and  $r$  each independently represents 0

B3d  
or an integer of 1 to 3.

12. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the resin (B) contains a repeating unit represented by the following formula (a):



(a)

wherein  $\text{R}$  represents hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group having from 1 to 4 carbon atoms, and  $\text{R}_{32}$  to  $\text{R}_{34}$ , which may be the same or different, each represents hydrogen atom or a hydroxyl group, provided that at least one of  $\text{R}_{32}$  to  $\text{R}_{34}$  represents a hydroxyl group.

13. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, which further contains an acid diffusion inhibitor.

14. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the

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acid diffusion inhibitor is a nitrogen-containing basic compound and the nitrogen-containing basic compound is at least one compound selected from the group consisting of 1,5-diazabicyclo[4.3.0]-5-nonene, 1,8-diazabicyclo[5.4.0]-7-undecene, 1,4-diazabicyclo[2.2.2]octane, 4-dimethylaminopyridine, hexamethylenetetramine, 4,4-dimethylimidazoline, pyrroles, pyrazoles, imidazoles, pyridazines, pyrimidines, tertiary morpholines and hindered amines having a hindered piperidine skeleton.

10 15. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the compound (A) is a sulfonic acid salt compound of sulfonium or iodonium.

15 16. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the compound (A) is a sulfonate compound of N-hydroxyimide or a disulfonyldiazomethane compound.

20 17. The positive photoresist composition for far ultraviolet exposure as claimed in claim 9, wherein the exposure light used is a far ultraviolet ray at a wavelength of 150 to 220 nm.

18. A positive photoresist composition for far ultraviolet exposure, comprising:

(A) a compound capable of generating an acid upon

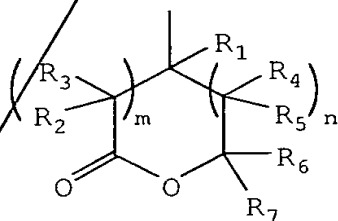
*Sub*  
*A3*

irradiation with actinic rays or radiation,

(B) a resin capable of decomposing under the action of an acid to increase the solubility in alkali, containing a repeating unit having a group represented by the following formula (I), and

(D) a solvent containing the following solvent (a) in an amount of 60 to 90 wt% based on the entire solvent:

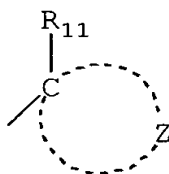
(a) at least one first solvent selected from propylene glycol monomethyl ether acetate, propylene glycol monomethyl ether propionate, methyl 3-methoxypropionate, ethyl 3-methoxypropionate, methyl 3-ethoxypropionate and ethyl 3-ethoxypropionate.



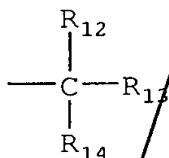
wherein  $R_1$  represents hydrogen atom or an alkyl group having from 1 to 4 carbon atoms, which may have a substituent,  $R_2$  to  $R_7$ , which may be the same or different, each represents hydrogen atom, an alkyl group which may have a substituent, a cycloalkyl group which may have a substituent or an alkenyl group which may have a substituent, provided that at least one of  $R_6$  and  $R_7$  is a group exclusive of hydrogen atom and  $R_6$  and  $R_7$  may combine to form a ring, and  $m$  and  $n$

each independently represents 0 or 1, provided that m and n are not 0 at the same time.

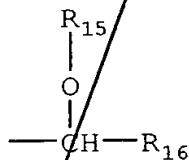
19. The positive photoresist composition for far ultraviolet exposure as claimed in claim 18, wherein the resin (B) further contains a repeating unit having an alkali-soluble group protected by at least one group containing an alicyclic hydrocarbon structure represented by the following formula (pI), (pII), (pIII), (pIV), (pV) or (pVI):



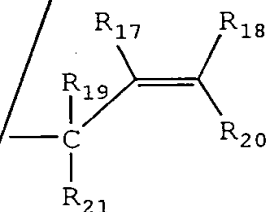
(pI)



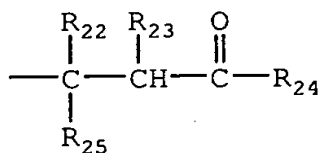
(pII)



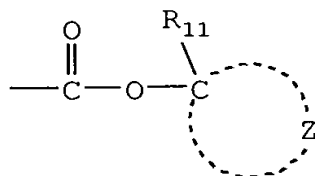
(pIII)



(pIV)



(pV)

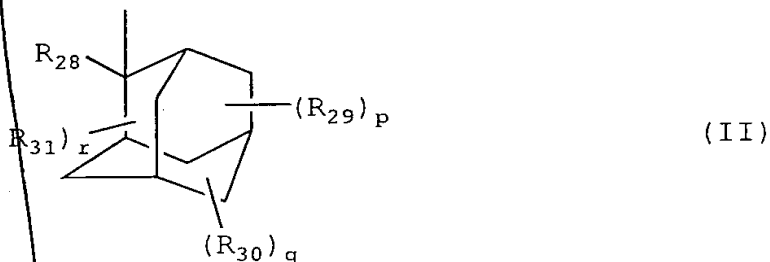


(pVI)

wherein R<sub>11</sub> represents a methyl group, an ethyl group, an n-propyl group, an isopropyl group, an n-butyl group, an isobutyl group or a sec-butyl group; Z represents an atomic group necessary for forming an alicyclic hydrocarbon group together with the carbon atom; R<sub>12</sub> to R<sub>16</sub> each independently represents a linear or branched alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms, provided that at least one of R<sub>12</sub> to R<sub>14</sub> or either one of R<sub>15</sub> and R<sub>16</sub> represents an alicyclic hydrocarbon group; R<sub>17</sub> to R<sub>21</sub> each independently represents hydrogen atom, a linear or branched alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms, provided that at least one of R<sub>17</sub> to R<sub>21</sub> represents an alicyclic hydrocarbon group and either one of R<sub>19</sub> and R<sub>21</sub> represents a linear or branched alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms; and R<sub>22</sub> to R<sub>25</sub> each independently represents a linear or branched

alkyl group having from 1 to 4 carbon atoms or an alicyclic hydrocarbon group having from 1 to 4 carbon atoms, provided that at least one of  $R_{22}$  to  $R_{25}$  represents an alicyclic hydrocarbon group.

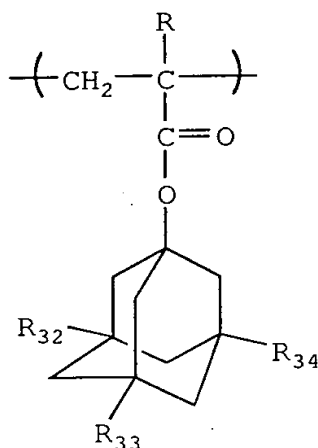
20. The positive photoresist composition for far ultraviolet exposure as claimed in claim 19, wherein the group containing an alicyclic hydrocarbon structure represented by the following formula (pI), (pII), (pIII), (pIV), (pV) or (pVI) is a group represented by the following formula (II):



wherein  $R_{26}$  represents an alkyl group which may have a substituent,  $R_{29}$  to  $R_{31}$ , which may be the same or different, each represents a hydroxy group, a halogen atom, a carboxy group, an alkyl group which may have a substituent, a cycloalkyl group which may have a substituent, an alkenyl group which may have a substituent, an alkoxy group which may have a substituent, an alkoxy carbonyl group which may have a substituent or an acyl group which may have a substituent, and  $p$ ,  $q$  and  $r$  each independently represents 0

B3  
or an integer of 1 to 3.

21. The positive photoresist composition for far ultraviolet exposure as claimed in claim 18, wherein the resin (B) contains a repeating unit represented by the following formula (a):



(a)

wherein  $\text{R}$  represents hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group having from 1 to 4 carbon atoms, and  $\text{R}_{32}$  to  $\text{R}_{34}$ , which may be the same or different, each represents hydrogen atom or a hydroxyl group, provided that at least one of  $\text{R}_{32}$  to  $\text{R}_{34}$  represents a hydroxyl group.

22. The positive photoresist composition for far ultraviolet exposure as claimed in claim 18, which further contains an acid diffusion inhibitor.

23. The positive photoresist composition for far ultraviolet exposure as claimed in claim 18, wherein the



compound (A) is a sulfonic acid salt compound of sulfonium or iodonium.

24. The positive photoresist composition for far ultraviolet exposure as claimed in claim 18, wherein the  
5 compound (A) is a sulfonate compound of N-hydroxyimide or a disulfonyldiazomethane compound.

25. The positive photoresist composition for far ultraviolet exposure as claimed in claim 18, wherein the exposure light used is a far ultraviolet ray at a  
10 wavelength of 150 to 220 nm.

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